420173

FLOOD INSURANCE STUDY

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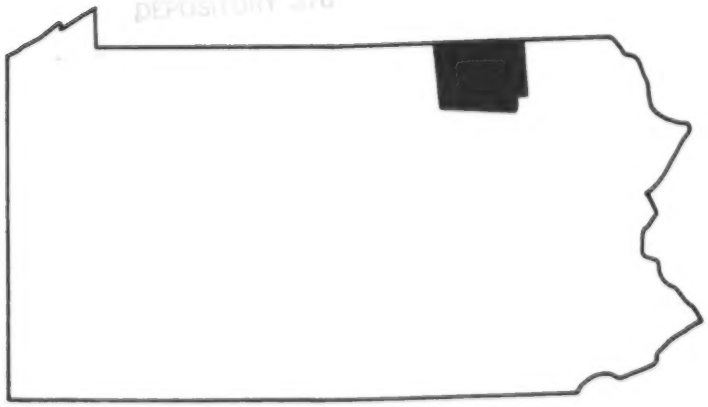
TOWNSHIP OF RIDGEBURY, PENNSYLVANIA
BRADFORD COUNTY



OCTOBER 1, 1980

federal emergency management agency
federal insurance administration

COMMUNITY NUMBER - 420173

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PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
TOWNSHIP OF RIDGEBURY, PENNSYLVANIA

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the Township of Ridgebury, Bradford County, Pennsylvania, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert the Township of Ridgebury to the regular program of flood insurance by the Federal Insurance Administration (FIA). Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

The Bradford County Planning Commission and the Northern Tier Regional Planning and Development Commission were contacted for information on the history of local flooding problems. Also, the Pennsylvania Department of Community Affairs was given notice of the study and invited to attend the consultation and coordination sessions which were held with local officials.

An initial Consultation and Coordination Officer's (CCO) meeting was held with township officials on June 23, 1975 to explain the flood insurance study procedures and to obtain from these officials any community flood information they could provide. A final CCO meeting was convened with township officials on February 22, 1979, to present the results of this study.

Flood discharge information was coordinated with the Baltimore District of the U. S. Army Corps of Engineers (COE), and the Harrisburg District Office of the U. S. Geological Survey (USGS).

1.3 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were prepared by the Susquehanna River Basin Commission (SRBC) for the Federal Insurance Administration under Contract No. H-3824. This work, which was

completed in March 1978, covered all the significant flooding sources in the Township of Ridgebury. Work maps for this study were compiled by Aero Service. Water-surface profile and floodway computations and flood boundary delineations were performed by Justin and Courtney. Both firms completed their work under sub-contract with the Susquehanna River Basin Commission.

2.0 AREA STUDIED

2.1 Scope of Study

This study covers the incorporated area of the Township of Ridgebury, Bradford County, Pennsylvania. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, areas of projected development and areas of proposed construction for the next five years, through March 1983. Three Falls Glen, Justice Run, and Buck Creek were studied through the use of detailed methods. Four-fifths of Bentley Creek also received detailed study.

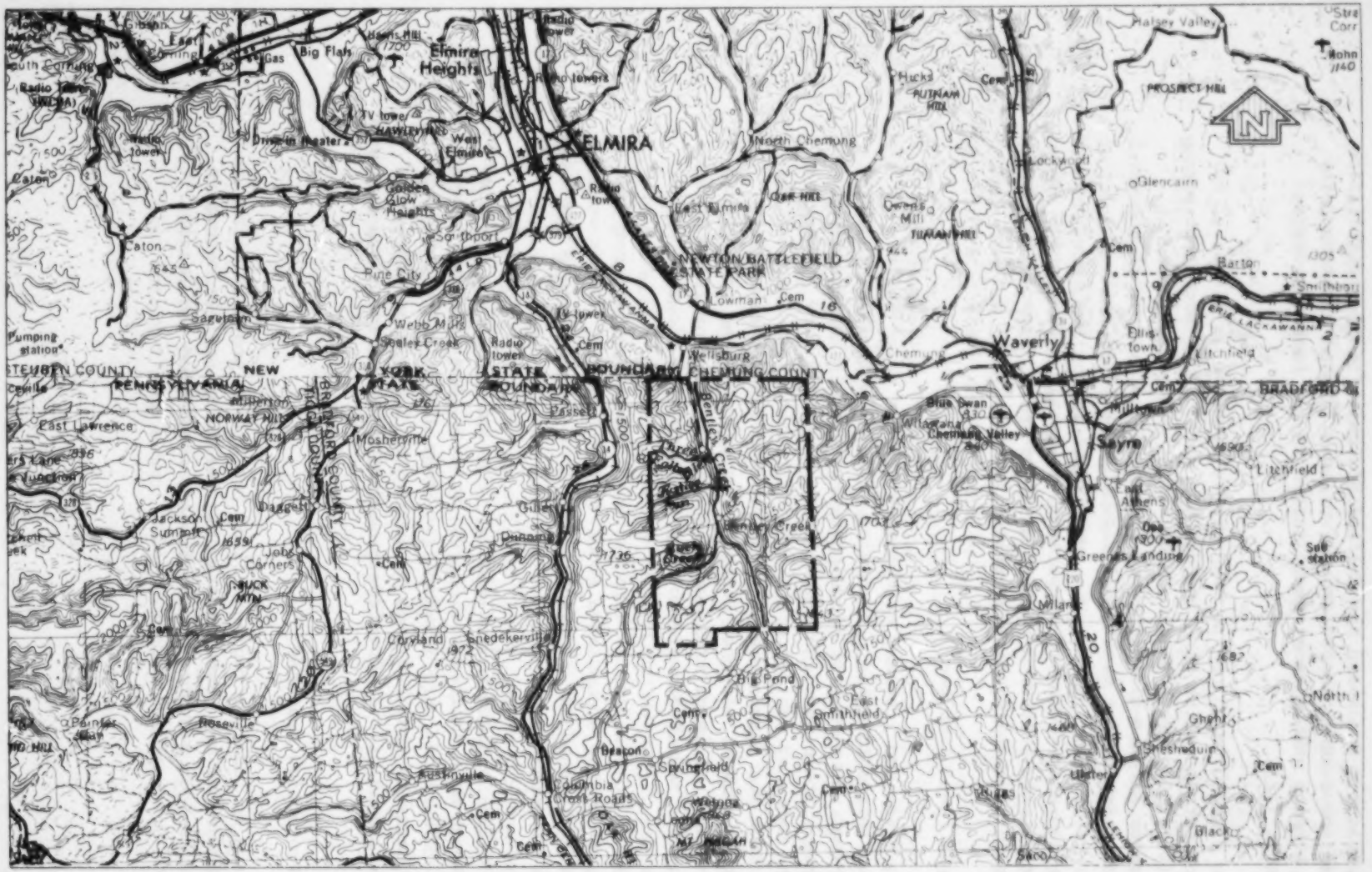
Approximate methods of analysis were used to study those areas having low development potential and/or minimal flood hazards as identified at the initiation of the study. The remainder of Bentley Creek, Stone Lick Creek, Trout Creek, Fall Creek, Tributary No. 1 to Fall Creek, Terwiliger Creek, and Tributary No. 1 to Terwiliger Creek, Three Falls Glen, part of Buck Creek, Miller Run, and Tributary No. 1 to Bentley Creek were studied by approximate methods.

The scope and methods of study were proposed to and agreed upon by the FIA.

2.2 Community Description

The Township of Ridgebury is located in northwestern Bradford County, in northeastern Pennsylvania. The New York State line forms the entire northern boundary of the township. The 1970 population was 1,669; a 24 percent increase since 1960. A total area of 38.4 square miles is included within the township.

The Township of Ridgebury lies in a glaciated, low plateau section of the Appalachian Plateau Province of Pennsylvania. Topography consists mainly of high, choppy hills interspersed among tracts of rolling farmland. There is also a large amount of level flood plain acreage adjoining the numerous streams which flow through the township.


ELMIRA
Elmira Heights
West Elmira
North Chemung
NEWTON BATTLEFIELD STATE PARK
Waverly
Sayre
Athens
Wellsburg
CHEMUNG COUNTY
STEUBEN COUNTY
PENNSYLVANIA
NEW YORK STATE BOUNDARY
BRADFORD CO.
Caton
Corning
Big Flats
Pine City
Webb Mills
Sagetown
Jackson Summit
Jobs Corners
Daggett
Moshertown
Gillett
Putnam
Coryland
Snedekerville
Roseville
Rushville
Spaulding
Columbia Cross Roads
Big Pond
East Smithfield
Litchfield
Towanda
Greenes Landing
Blue Swan
Chemung Valley
Glencairn
PROSPECT HILL
Barton
Smithboro
Ulster
Athens
Sub station
Cem
Radio tower
Drive-in Theater
TV tower
Golden Glow Heights
Sayre
Elmira Heights
Hills
Creek
Run
Mtn
Hill
Pond
Valley
Junction
Lane
Corners
Summit
Crossroads
Heights
Glow
Golden
Glencairn
Litchfield
Towanda
Athens
Sayre
Waverly
Elmira
Chemung
Corning
Caton
Coryland
Roseville
Rushville
Spaulding
Snedekerville
Gillett
Putnam
Daggett
Moshertown
Sagetown
Pine City
Webb Mills
Big Flats
East Corning
South Corning
Gibson
Painter Run
Black Mtn
Jackson Summit
Jobs Corners
Columbia Cross Roads
Big Pond
East Smithfield
Greenes Landing
Blue Swan
Chemung Valley
Wellsburg
Lowman
Cem
Radio tower
TV tower
Drive-in Theater

Climate in the area is continental, but it is modified by the affects of the Atlantic Ocean and the Gulf of Mexico. Annual precipitation averages about 40-42 inches and is well distributed throughout the year. Average annual temperature ranges in the high 40s degrees Fahrenheit (°F).

The low plateau on which the township is situated is dissected by the many streams which pass through the area. Most prominent among these is Bentley Creek which drains almost the entire township. Other major streams are listed in Section 2.1 above. With the exception of Stone Lick Creek, all flow into Bentley Creek.

Flood plain areas along these streams are mainly undeveloped. However, there are scattered pockets of development, especially along the legislative route which parallels Bentley Creek.

2.3 Principal Flood Problems

Bentley Creek and its many tributaries are the chief sources of flooding in the township. According to local officials, the 1972 Agnes Flood was the worst flooding experienced in the Bentley Creek watershed. There was light to moderate damage to many properties near the banks of Bentley Creek and its tributaries. Much of this damage took the form of severe soil erosion rather than actual structural damage. Several homes had entire sections of backyard washed away. Sediment from such washouts shallowed streams at some places, thus reducing their ability to carry high flows.

In addition to residential damages, an aluminum manufacturer lost a large part of his accumulated stock to flood waters. Roads were flooded and washed out at several locations and one bridge was swept off its foundations.

The 1975 Eloise flood caused similar problems throughout the township though on a smaller scale. Two bridges, one already weakened by the 1972 flood, were destroyed. Stream siltation refilled some stream segments that had been cleared after Agnes thus increasing the likelihood of bank overflow even during heavy, localized thunderstorms.

2.4 Flood Protection Measures

There are no local or regional flood protection projects either in existence or in the planning stages. The U. S. Soil Conservation service has, on a number of occassions, considered the feasibility

of some type of flood control project under the P. L. 566 Small Watershed Program. So far, however, flood damages in the Bentley Creek watershed do not justify construction of a flood control project.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Floods having recurrence intervals of 10, 50, 100, and 500 years have been selected as having special significance for flood plain management and for flood insurance premium rates. The analyses reported here reflect current conditions in the watersheds of the flooding sources.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the township.

For the purpose of this study, the log-Pearson Type III method recommended by the Water Resources Council was used to determine discharge relationships (Reference 1). For gaged sites, the flood-frequency data is obtained directly from peak discharge data. For ungaged sites, it was necessary to regionalize the flood-frequency data for two or more sites.

The log-Pearson Type III method requires the mean, M, the standard deviation, S, and the skew coefficient. For Bentley Creek, Three Falls Glen, Justice Run and Buck Creek, which are ungaged streams, this information was obtained from the regional flood frequency procedure (Reference 2) developed by the COE. This procedure is based on log-Pearson Type III analysis of a large number of station records in the Susquehanna Basin through 1972. The log-Pearson analysis uses the following equations:

$$M = C_m + 0.75 \log (A)$$

$$S - C_s - 0.05 \log (A)$$

where A is the drainage area in square miles and C_m and C_s are coefficients, which are obtained from maps. The skew coefficient is also obtained from a map. The Susquehanna River Basin Commission

has made some modifications to the C_m map and also the skew coefficient map for use in this study.

A summary of drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
BENTLEY CREEK					
At New York-Pennsylvania State Line	52.0	8,000	15,500	20,000	34,000
At mouth of Three Falls Glen	45.7	7,200	14,000	18,200	33,000
At mouth of Justice Run	36.1	6,050	12,100	16,000	29,000
At mouth of Buck Creek	22.7	4,450	9,000	11,800	22,000
THREE FALLS GLEN					
At mouth	1.91	830	1,850	2,500	5,650
JUSTICE RUN					
At mouth	4.25	1,450	3,170	4,300	8,700
BUCK CREEK					
At mouth	10.2	2,650	5,650	7,500	14,500

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of these flooding sources.

Water-surface profiles for the 10-, 50-, 100-, and 500-year floods were calculated using the COE HEC-2 step-backwater program (Reference 3). Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. Cross sections were located at regular intervals along the stream length and at significant changes in ground relief, land use, and land cover. Ground elevations for the cross sections were photogrammetrically obtained as 1:2,400 scale base maps were compiled (Reference 4). Stream channel-bottom elevations were taken from field-surveyed cross sections at an interval distance of not more than 1,000 feet. Locations of selected cross

sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2) selected cross-section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 3).

Reach lengths for the stream channel were measured along the centerline of the channel and between cross sections as scaled from the 1:2,400 maps (Reference 4). The overbank reach lengths were measured along the approximate centerline of the effective out-of-channel area as scaled from the 1:2,400 maps (Reference 4).

Backwater elevations for Bentley Creek were started at the mouth using cross sections and elevations obtained by the SRBC during the previous studies of the Village of Wellsburg, New York, and the Town of Chemung, New York (References 5 and 6).

Buck Creek backwater elevations were started at the mouth using coincident conditions with Bentley Creek based on the assumption that both streams will peak concurrently. Justice Run backwater elevations were started at the mouth using critical depth calculations developed by the SRBC. Backwater elevations for Three Falls Run were started at the mouth using a rating curve developed for Bentley Creek.

Channel roughness factors (Manning's "n" values) were assigned on the basis of field inspection of flood plain areas. Roughness values for the main channel of Bentley Creek and for the channel of its tributary, Three Falls Glen, range from 0.038 to 0.043. The channel roughness value for the two tributaries, Buck Creek and Justice Run, is 0.038. Roughness values for the Bentley Creek flood plain range from 0.06 to 0.18 while flood plain roughness values for Three Falls Glen, Buck Creek, and Justice Run range from 0.09 to 0.14.

For Trout Creek, Fall Creek, Terwiliger Creek, Tributary No. 1 to Terwiliger Creek, and Stone Lick Creek, no detailed studies were done because of the lack of current or planned development along the streams. The 100-year flood for these streams studied by approximate methods were developed through the use of a computer program prepared by the SRBC to calculate normal water depths and water-surface elevations using data from USGS quadrangles.

All elevations used in this study are referenced to the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Sea Level Datum of 1929. Locations of the elevation reference marks used in the study are shown on the maps.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are valid only if the hydraulic structures remain unobstructed.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage state and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:2,400 with a contour interval of 5 feet (Reference 4). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year boundary has been shown.

The methodology for the delineation of approximate flood boundaries is described in Section 3.2. Approximate boundaries for Justice Run, Three Falls Glen, Wolcott Creek, Tributary Number 1 to Fall Creek, part of Terwiliger Creek, part of Buck Creek, Miller Run, part of Bentley Creek, part of Fall Creek, and part of Trout Creek, were transferred as delineated on the Flood Hazard Boundary Map of the Township of Ridgebury (Reference 7).

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations, and therefore, may not be subject to flooding. Owing to limitations of the map scale and lack of detailed topographic data, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One

aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood can be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plains. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 3), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

Floodwaters from Bentley Creek were found to have hazardous velocities. Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage, and heightens potential flood hazards by further increasing velocities. To provide guidance for encroachment into these areas, a proposed floodway is delineated for that part of the 100-year flood plain that conveys flow.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE [1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Bentley Creek								
A	0	548[2]	2,995	6.7	871.7	871.7	872.7	1.0
B	267	234	1,688	11.8	872.7	872.7	873.0	0.3
C	605	364	2,234	9.0	875.3	875.3	876.3	1.0
D	992	327	2,262	8.8	878.3	878.3	878.7	0.4
E	1,442	438	3,206	6.2	881.5	881.5	882.5	1.0
F	1,812	252	1,893	10.6	882.7	882.7	883.3	0.6
G	2,307	351	2,068	9.7	887.2	887.2	887.7	0.5
H	2,872	438	2,842	7.0	892.0	892.0	892.9	0.9
I	3,317	321	1,512	13.2	894.6	894.6	894.6	0.0
J	3,955	450	2,645	7.6	900.6	900.6	901.4	0.8
K	4,455	400	1,754	11.4	905.4	905.4	905.4	0.0
L	5,083	346	2,361	8.5	910.9	910.9	911.4	0.5
M	5,562	300	2,437	8.2	915.1	915.1	915.3	0.2
N	6,524	400	3,085	6.5	920.5	920.5	921.3	0.8
O	6,962	530	2,599	7.7	921.7	921.7	922.4	0.7
P	7,922	770	3,326	6.0	931.0	931.0	931.6	0.6
Q	8,294	920	3,251	6.2	933.2	933.2	934.0	0.8
R	8,634	920	4,203	4.8	936.8	936.8	937.8	1.0
S	10,079	520	2,573	7.8	948.7	948.7	949.1	0.4

[1] Stream distance in feet above state boundary
[2] This width extends beyond corporate limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

FLOODWAY DATA

BENTLEY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Bentley Creek (continued)								
T	10,499	265	1,870	10.7	953.5	953.5	954.1	0.6
U	10,749	287	3,165	6.3	958.7	958.7	959.5	0.8
V	11,929	351	1,661	11.0	963.7	963.7	964.3	0.6
W	12,264	359	2,059	8.8	967.0	967.0	967.6	0.6
X	12,729	438	2,298	7.9	970.8	970.8	971.4	0.6
Y	13,336	368	2,201	8.3	975.2	975.2	975.9	0.7
Z	13,784	428	2,015	9.0	978.5	978.5	979.1	0.6
AA	14,369	491	1,983	9.2	983.7	983.7	984.1	0.4
AB	15,059	592	3,039	6.0	988.6	988.6	989.5	0.9
AC	15,549	486	2,306	7.9	993.3	993.3	994.0	0.7
AD	15,845	438	2,819	6.5	995.8	995.8	996.6	0.8
AE	16,125	233	1,705	10.7	997.9	997.9	998.1	0.2
AF	16,970	194	1,566	11.6	1,005.7	1,005.7	1,006.6	0.9
AG	17,663	278	2,240	7.1	1,011.1	1,011.1	1,011.9	0.8
AH	18,242	328	1,509	10.6	1,014.6	1,014.6	1,014.7	0.1
AI	19,012	493	2,530	6.3	1,020.5	1,020.5	1,021.5	1.0
AJ	19,652	362	1,286	12.4	1,026.0	1,026.0	1,026.0	0.0
AK	20,006	277	1,310	12.2	1,031.1	1,031.1	1,031.1	0.0

[1] Stream distance in feet above state boundary

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

FLOODWAY DATA

BENTLEY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Bentley Creek (continued)								
AL	21,081	281	1,393	11.5	1,038.7	1,038.7	1,038.8	0.1
AM	21,849	336	2,045	7.8	1,045.3	1,045.3	1,046.2	0.9
AN	22,174	198	1,153	13.9	1,047.5	1,047.5	1,047.5	0.0
AO	22,744	150	1,425	11.2	1,055.4	1,055.4	1,056.0	0.6
AP	22,799	150	1,535	10.4	1,056.3	1,056.3	1,056.6	0.3
AQ	23,074	163	1,206	13.3	1,057.1	1,057.1	1,057.5	0.4
AR	23,364	510	2,323	6.9	1,062.1	1,062.1	1,062.3	0.2
AS	23,558	618	3,932	4.1	1,064.9	1,064.9	1,065.9	1.0
AT	23,903	376	1,697	9.4	1,067.2	1,067.2	1,067.8	0.6
AU	24,281	360	1,384	8.5	1,070.9	1,070.9	1,071.3	0.4
AV	24,756	131	879	13.4	1,078.2	1,078.2	1,078.2	0.0
AW	25,446	184	1,163	10.2	1,083.3	1,083.3	1,084.2	0.9
AX	25,996	152	939	12.6	1,090.6	1,090.6	1,090.6	0.0
AY	26,751	205	938	12.6	1,095.6	1,095.6	1,096.6	1.0
AZ	27,181	246	1,285	9.2	1,102.3	1,102.3	1,102.3	0.0
BA	27,471	263	1,030	11.5	1,104.5	1,104.5	1,104.5	0.0
BB	28,141	424	1,730	6.8	1,110.1	1,110.1	1,111.1	1.0
BC	28,811	225	1,360	8.7	1,118.9	1,118.9	1,119.5	0.6

[1] Stream distance in feet above state boundary

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

FLOODWAY DATA

BENTLEY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Bentley Creek (continued)								
BD	29,536[1]	192	872	13.5	1,126.7	1,126.7	1,126.7	0.0
BE	30,106[1]	203	1,224	9.6	1,134.5	1,134.5	1,134.5	0.0
BF	30,526[1]	212	1,028	11.5	1,137.0	1,137.0	1,137.0	0.0
BG	30,726[1]	121	805	14.7	1,142.2	1,142.2	1,143.0	0.8
Three Falls Glen								
CA	325[2]	153	426	5.9	960.5	960.5	961.1	0.6
CB	536[2]	62	181	13.8	969.3	969.3	969.3	0.0
CC	721[2]	50	148	16.9	973.8	973.8	973.8	0.0
CD	916[2]	38	72	34.7	980.0	980.0	980.0	0.0
CE	1,126[2]	25	192	13.0	1,005.6	1,005.6	1,005.6	0.0
Justice Run								
DA	485[2]	227	703	6.1	1,011.8	1,011.8	1,012.3	0.5
DB	695[2]	51	306	14.0	1,016.0	1,016.0	1,016.0	0.0
DC	900[2]	67	275	15.6	1,018.5	1,018.5	1,018.5	0.0
DD	1,330[2]	75	276	15.6	1,029.1	1,029.1	1,029.1	0.0
DE	1,650[2]	55	245	17.6	1,037.7	1,037.7	1,037.9	0.2

[1]Stream distance in feet above state boundary
[2]Stream distance in feet above confluence with Bentley Creek

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

FLOODWAY DATA

BENTLEY CREEK, THREE FALLS GLEN AND JUSTICE RUN

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Justice Run (continued)								
DF	2,110	48	272	15.8	1,049.2	1,049.2	1,049.8	0.6
DG	2,565	53	222	19.3	1,060.9	1,060.9	1,061.1	0.2
DH	3,115	41	287	15.0	1,075.6	1,075.6	1,076.4	0.8
DI	3,500	67	250	17.2	1,082.3	1,082.3	1,082.3	0.0
DJ	3,860	47	230	18.7	1,092.2	1,092.2	1,093.0	0.8
DK	4,180	48	301	14.3	1,102.2	1,102.2	1,102.2	0.0
DL	4,380	52	256	16.8	1,103.3	1,103.3	1,103.6	0.3
DM	4,795	40	205	20.9	1,114.8	1,114.8	1,114.8	0.0
DN	5,060	42	251	17.1	1,123.2	1,123.2	1,124.2	1.0
Buck Creek								
A	577	157	633	11.9	1,067.7	1,067.7	1,068.1	0.4
B	917	211	717	10.5	1,072.7	1,072.7	1,072.8	0.1
C	1,197	97	416	18.0	1,074.9	1,074.9	1,074.9	0.0
D	1,407	132	661	11.4	1,078.9	1,078.9	1,079.4	0.5
E	1,707	156	787	9.5	1,084.8	1,084.8	1,085.1	0.3
F	1,977	196	984	7.6	1,089.1	1,089.1	1,089.9	0.8

[1]Stream distance in feet above confluence with Bentley Creek

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

FLOODWAY DATA

JUSTICE RUN AND BUCK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Buck Creek (continued)								
G	2,547	80	387	19.4	1,097.0	1,097.0	1,097.0	0.0
H	2,867	110	661	11.4	1,104.3	1,104.3	1,105.3	1.0
I	3,127	76	497	15.1	1,107.3	1,107.3	1,108.1	0.8
J	3,587	243	847	8.9	1,115.2	1,115.2	1,115.7	0.5
K	3,937	316	1,289	5.8	1,120.3	1,120.3	1,121.1	0.8
L	4,287	92	408	18.4	1,126.0	1,126.0	1,126.2	0.2
M	4,517	120	604	12.4	1,130.5	1,130.5	1,131.4	0.9
N	5,007	120	592	12.7	1,138.6	1,138.6	1,139.2	0.6
O	5,247	110	609	12.3	1,144.3	1,144.3	1,144.5	0.2
P	5,517	75	338	22.2	1,146.7	1,146.7	1,146.8	0.1
Q	5,812	65	473	15.8	1,157.7	1,157.7	1,157.7	0.0

[1]Stream distance in feet above confluence with Bentley Creek

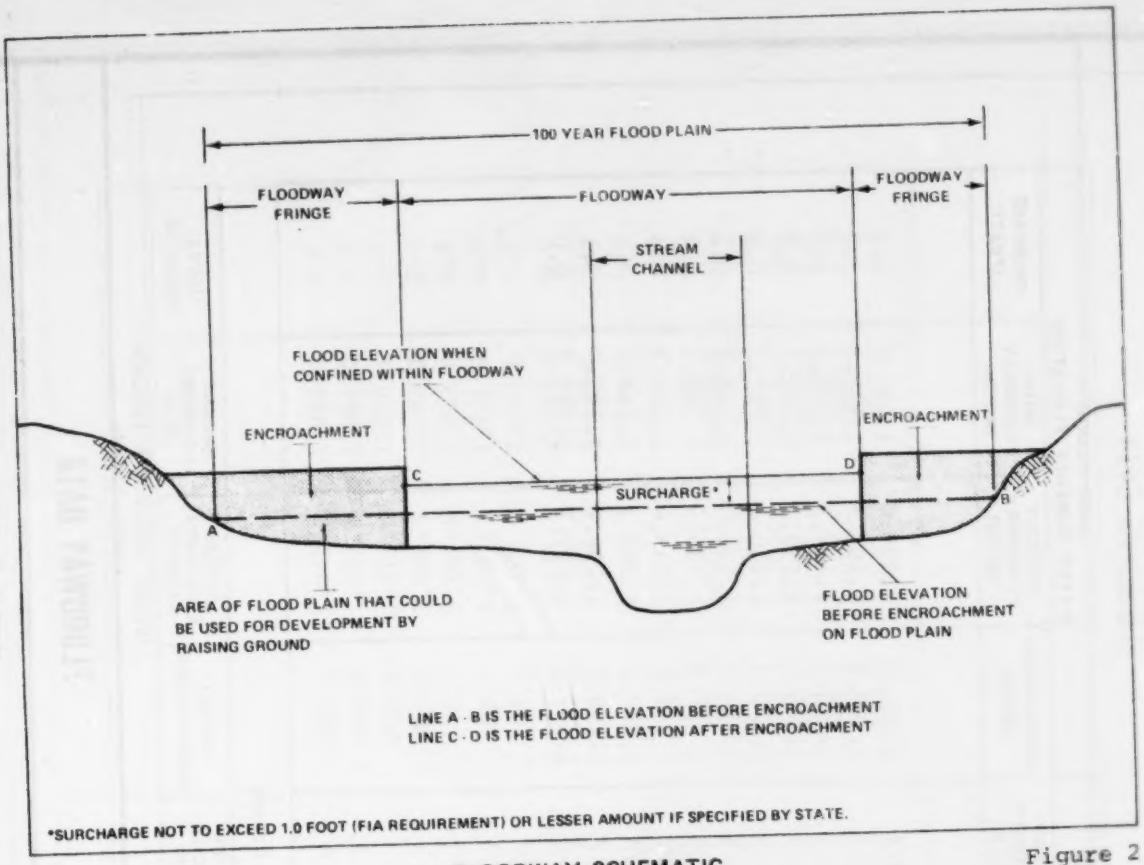
TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

FLOODWAY DATA

BUCK CREEK


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC

Figure 2

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each flooding source studied in detail affecting Ridgebury Township.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot

The locations of reaches determined for the flooding sources of the Township of Ridgebury are shown on the Flood Profiles (Exhibit 1) and are summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The FHF is the FIA device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of Ridgebury Township was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.

Zones A3, A5, A6: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHF.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Bentley Creek Reach 1	05, 15	-3.0	-0.9	+2.2	030	A6	Varies
Three Falls Glen Reach 1 Reach 2	05 05	-1.4 -2.4	-0.5 -0.7	+1.1 +2.2	015 025	A3 A5	Varies Varies
Justice Run Reach 1	05	-2.6	-0.9	+2.1	025	A5	Varies
Buck Creek Reach 1	15	-2.6	-0.8	+1.9	025	A5	Varies

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

FLOOD INSURANCE ZONE DATA

BENTLEY CREEK, THREE FALLS GLEN, JUSTICE RUN AND BUCK CREEK

Zone B: Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also, areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding sources studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for Ridgebury is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

A flood insurance study for Township of Athens (Reference 8) was prepared concurrently with this study and flood insurance studies were previously prepared for the New York communities of Village of Wellsburg and Town of Chemung (References 5 and 6). Data presented in these studies are in exact agreement with the data presented for the Township of Ridgebury.

This study is authoritative for purposes of the Flood Insurance Program and the data presented here either supersede or are compatible with previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Insurance and Mitigation Division of the Federal Emergency Management Agency, Regional Director, Region III Office, Curtis Building, Sixth and Walnut Streets, Philadelphia, Pennsylvania 19106.

8.0 BIBLIOGRAPHY AND REFERENCES

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7. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Township of Ridgebury, Bradford County, Pennsylvania, Washington, D. C., January 9, 1974.

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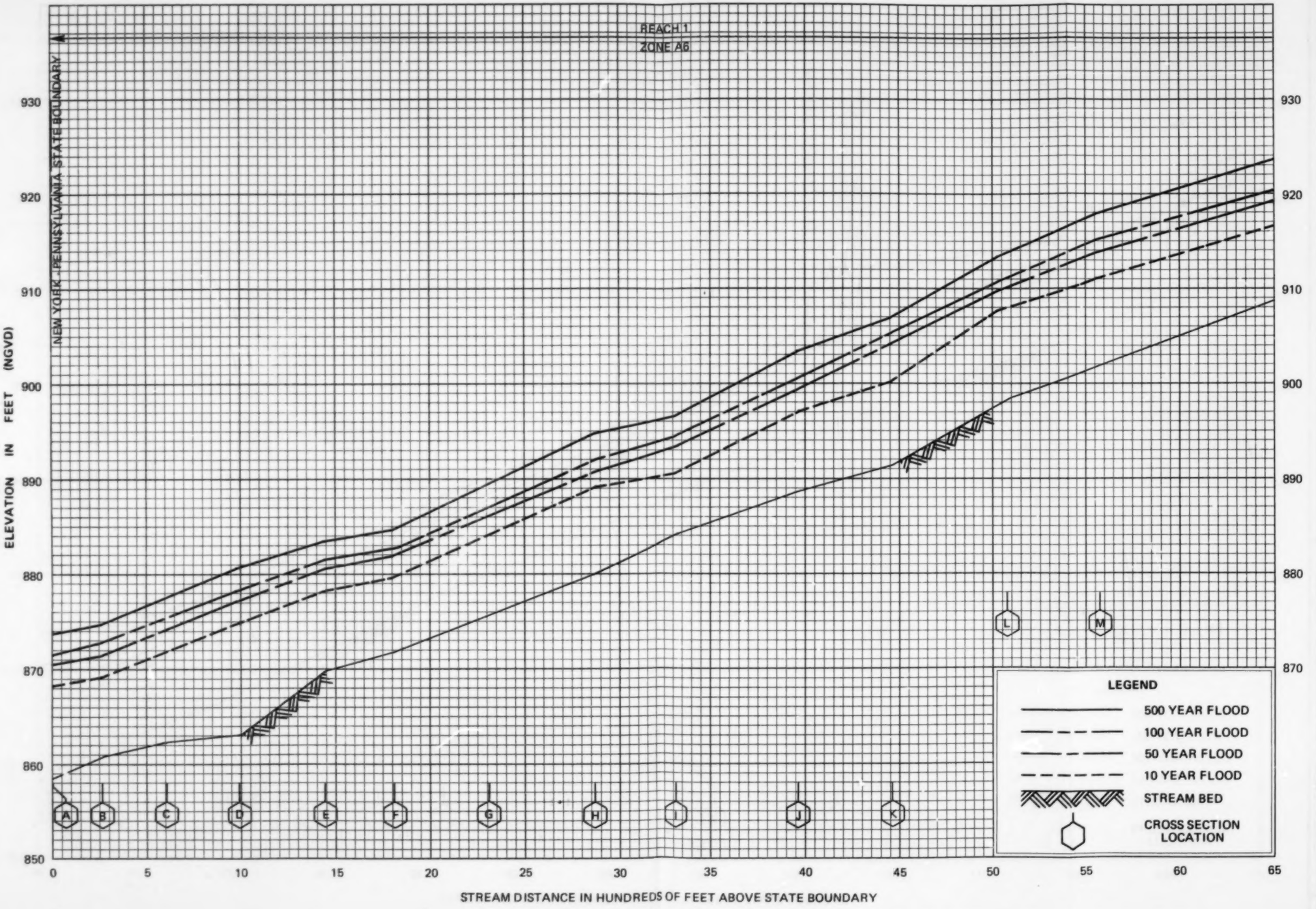


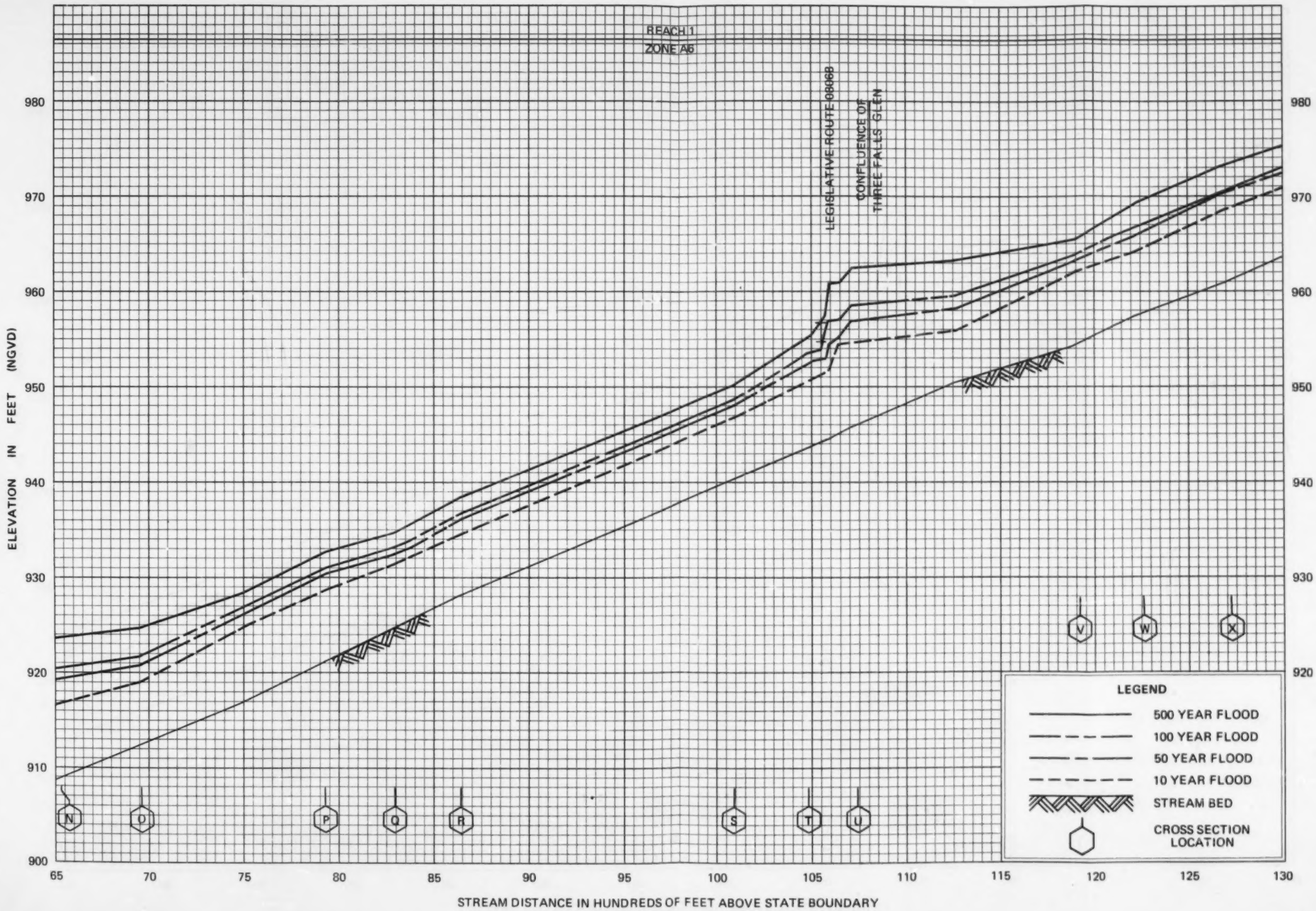
FLOOD PROFILES

BENTLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

01P



FLOOD PROFILES

BENTLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

02P

REACH 1
ZONE A6

CONFLUENCE OF JUSTICE RUN

ELEVATION IN FEET (NGVD)

1030
1020
1010
1000
990
980
970
960

130 135 140 145 150 155 160 165 170 175 180 185 190 195

STREAM DISTANCE IN HUNDREDS OF FEET ABOVE STATE BOUNDARY

Y Z AA AB AC AD AE AF AG AH AI

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

BENTLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

03P

REACH 1
ZONE A6

TOWNSHIP ROUTE 374

LEGISLATIVE ROUTE 08144

CONFLUENCE OF BUCK CREEK

ELEVATION IN FEET (NGVD)

1090
1080
1070
1060
1050
1040
1030
1020
1010

AJ AK AL AM AN AO AP AQ AR AS AT AU AV

195 200 205 210 215 220 225 230 235 240 245 250

STREAM DISTANCE IN HUNDREDS OF FEET ABOVE STATE BOUNDARY

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

BENTLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

04P

FLOOD PROFILES

BENTLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

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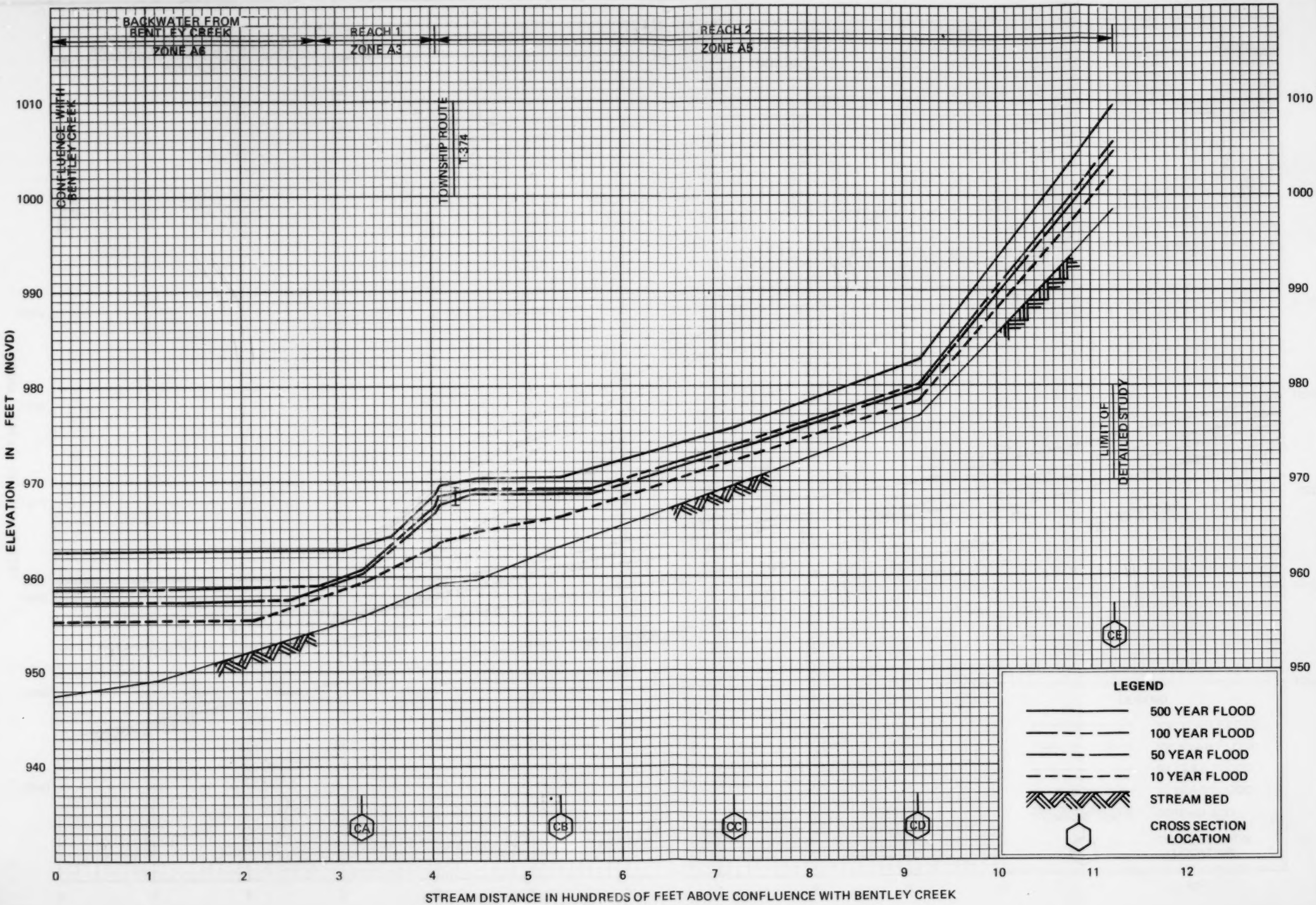

FLOOD PROFILES

THREE FALLS GLEN

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

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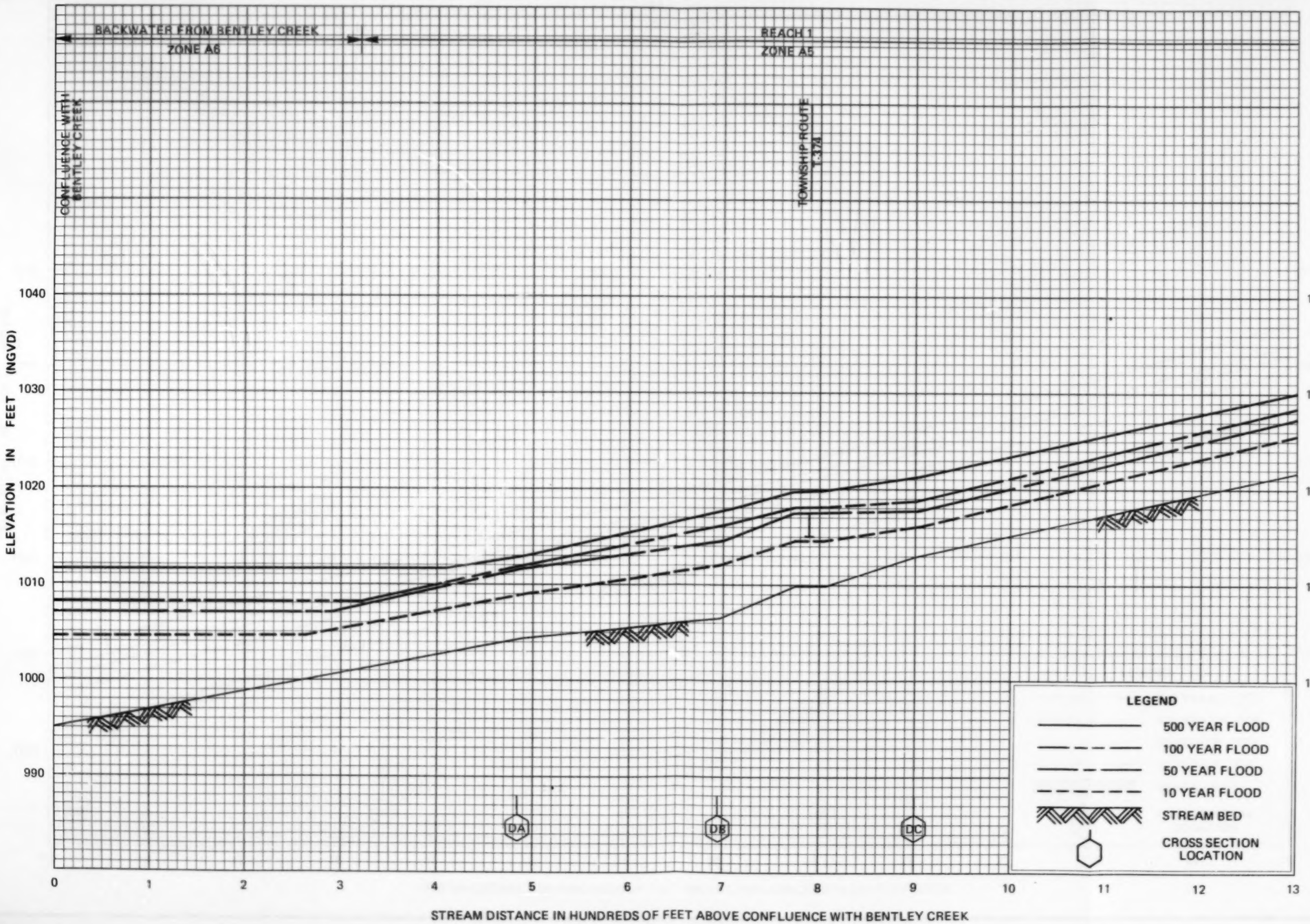

FLOOD PROFILES

JUSTICE RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

07P

REACH 1
ZONE A5

ELEVATION IN FEET (NGVD)

1070
1060
1050
1040
1030
1020

13 14 15 16 17 18 19 20 21 22 23 24 25 26

STREAM DISTANCE IN HUNDREDS OF FEET ABOVE CONFLUENCE WITH BENTLEY CREEK

DD DE DF DG

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

JUSTICE RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY
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TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

08P

REACH 1
ZONE A5

ELEVATION IN FEET (NGVD)

1100
1090
1080
1070
1060
1050

26 27 28 29 30 31 32 33 34 35 36 37 38 39

STREAM DISTANCE IN HUNDREDS OF FEET ABOVE CONFLUENCE WITH BENTLEY CREEK

DH
DI
DJ

LEGEND
- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

JUSTICE RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

09P

REACH 1
ZONE A5

LIMIT OF DETAILED STUDY

ELEVATION IN FEET (NGVD)

1130
1120
1110
1100
1090
1080

DK
DL
DM
DN

LEGEND
- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

39 40 41 42 43 44 45 46 47 48 49 50 51

STREAM DISTANCE IN HUNDREDS OF FEET ABOVE CONFLUENCE WITH BENTLEY CREEK

FLOOD PROFILES

JUSTICE RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

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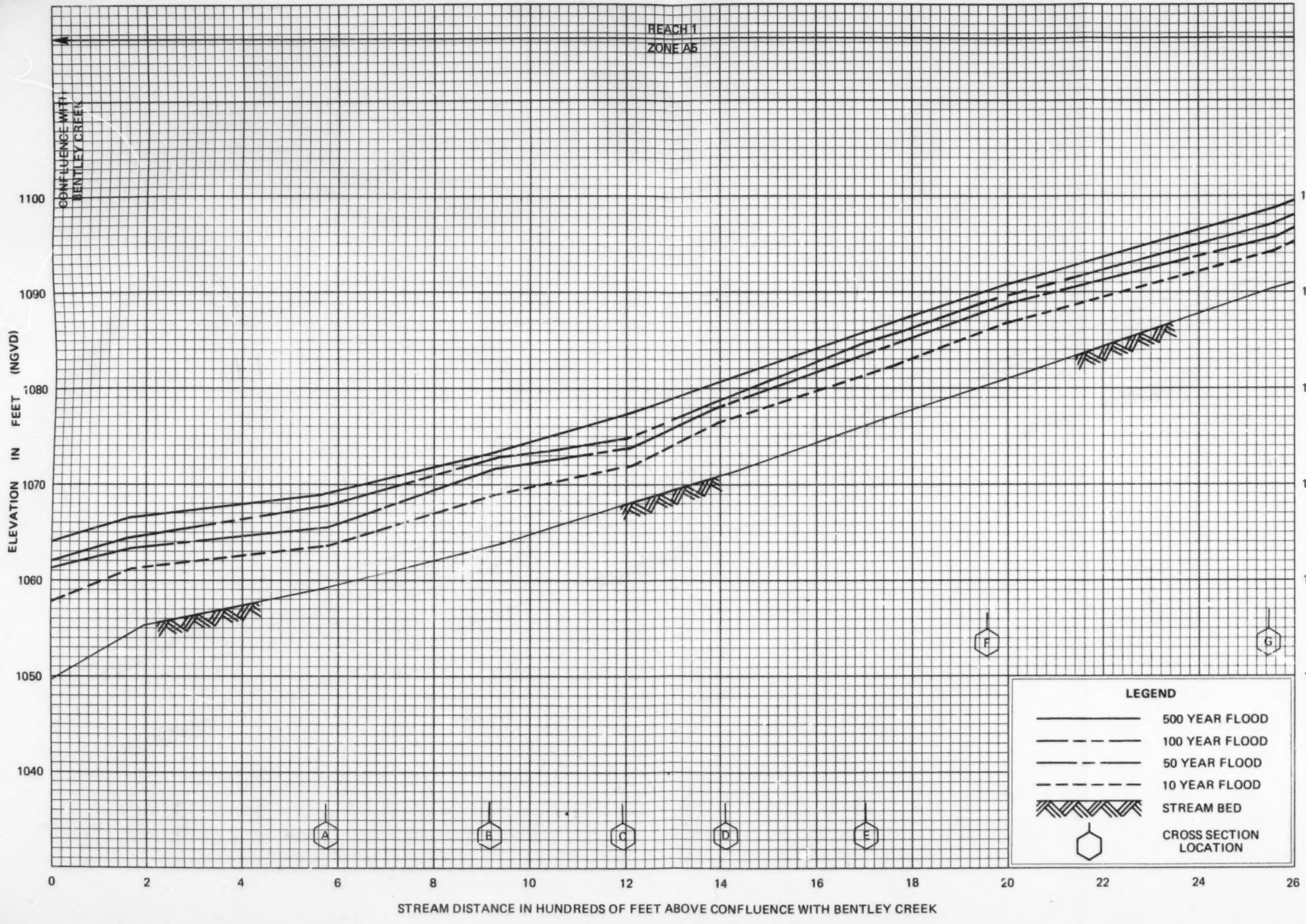


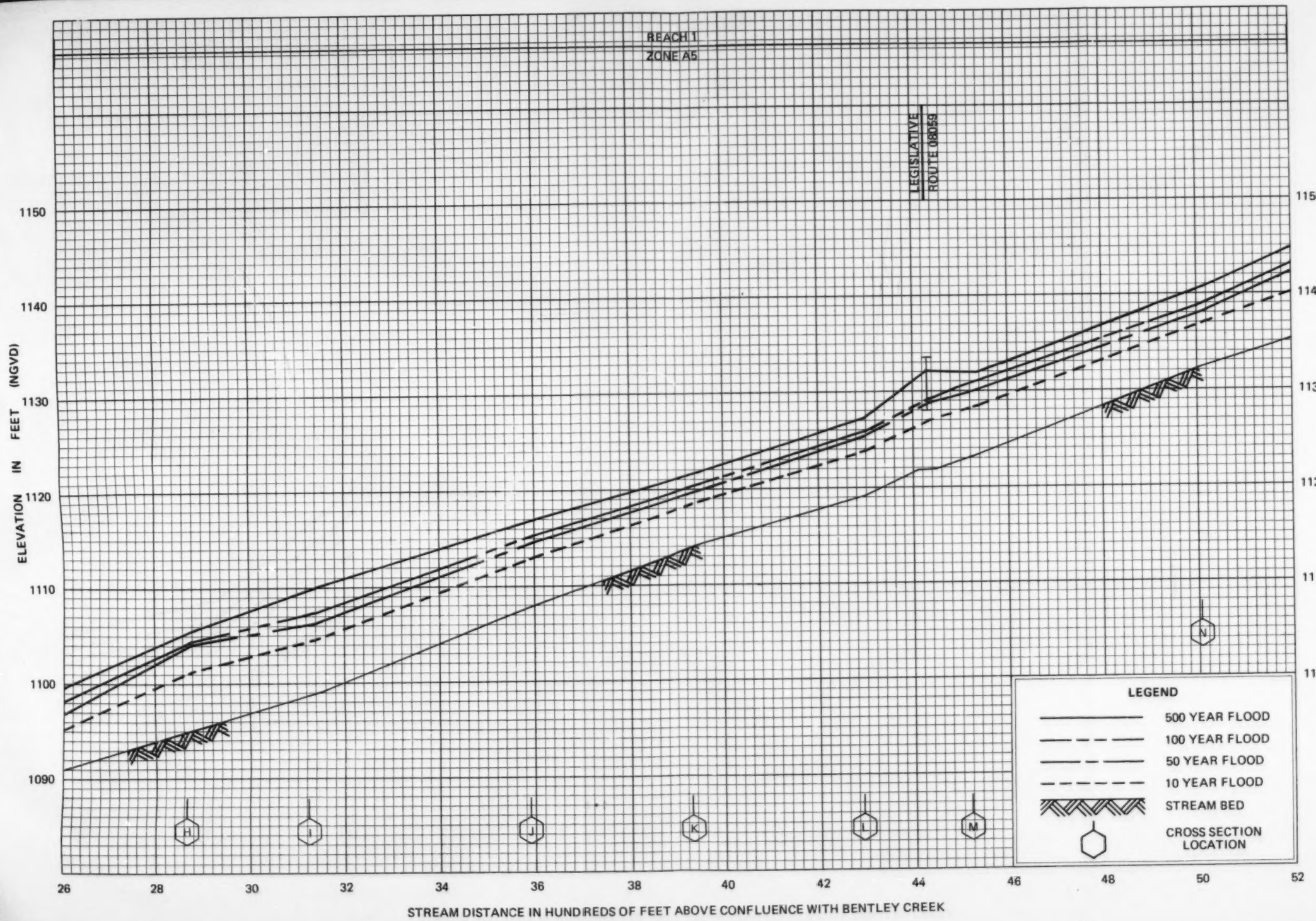
FLOOD PROFILES

BUCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

11P



FLOOD PROFILES

BUCK CREEK

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Federal Insurance Administration

TOWNSHIP OF RIDGEBURY, PA
(BRADFORD CO.)

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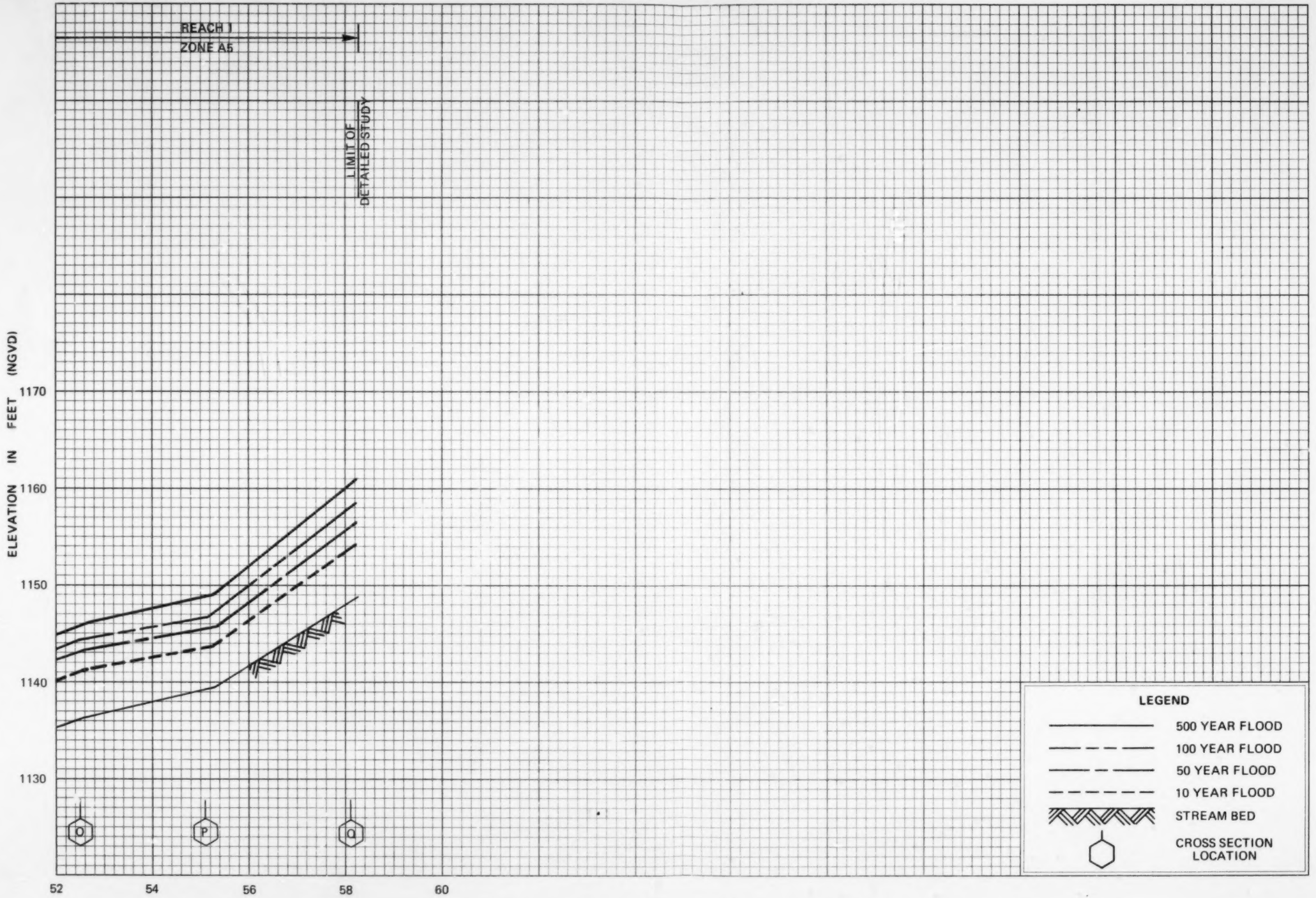

FLOOD PROFILES

BUCK CREEK

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